VOLUME XII NUMBER 3

THE ELEMENTARY SCHOOL TEACHER

NOVEMBER, 1911

PESTALOZZIAN FORMALISM

DEGENERATE OBJECT-TEACHING; SIMPLE TO COMPLEX

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In the last two volumes of the *Elementary School Teacher*, a number of articles appeared which were intended to illustrate a method of teaching the history of education by emphasizing school practice in its relation to social conditions. This is the seventh article in this series. A textbook entitled *A History of Modern Elementary Education*, constructed on this principle, by the same author will appear in the near future.

In the history of educational changes, it is not uncommon to find that a reform which has been initiated as a protest against the formalism of words, of teaching devices, and of excessive routine, often degenerates very rapidly into the same kind of formalism that called forth the protest. This degeneration is well illustrated by the developments in Pestalozzian object-teaching, which became as pernicious in some of its aspects as it was beneficial in others. The tendency to formalism was also inherent in another phase of Pestalozzian reforms, namely in the application of the principle of proceeding from the simple to the complex in the teaching of all subjects. It is the purpose of this paper to discuss these two forms of Pestalozzian formalism. The discussion has a practical bearing on many present practices in elementary schools, practices which are essentially Pestalozzian in character and to a certain extent in origin.

Pestalozzi realized the danger of formalism.—Pestalozzi realized clearly the danger of degeneration into formalism and said:

I know too well how it will be; this poor husk, which is but the mere outward form of my method, will appear to be its real substance to a great number of men, who will endeavor to introduce this form into the narrow circle of their own ideas, and will judge of the value of the method according to the effects it produces in this strange association. I cannot prevent the forms of my method from having the same fate as all other forms, which inevitably perish in the hands of men who are neither desirous nor capable of grasping their spirit.

Herbert Spencer described Pestalozzian formalism in England.—One of the best accounts of Pestalozzian formalism versus the Pestalozzian spirit is found in the second chapter of the work by Herbert Spencer (1820–1903) on *Education*, published in 1861. Spencer's chapter contains an exposition of English Pestalozzianism which, as we noticed in an earlier article, tended toward this formal type. Spencer rejected the particular forms while approving strongly of the fundamental principles. He said:

While, therefore, we would defend in its entire extent the general doctrine which Pestalozzi inaugurated, we think great evil likely to result from an uncritical reception of his specific devices. That tendency which mankind constantly exhibit to canonize the forms and practices along with which any great truth has been bequeathed to them—their liability to prostrate their intellects before the prophet and swear by his every word—their proneness to mistake the clothing of the idea for the idea itself renders it needful to insist strongly upon the distinction between the fundamental principles of the Pestalozzian system, and the set of expedients derived for its practice.

This Pestalozzian formalism can be discussed to advantage under two main heads: (1) degenerate object-teaching, and (2) extreme and false applications of the theory of proceeding from the simple to the complex.

Degenerate object-teaching. Pestalozzi recommended memorizing words.—Strange as it may seem, Pestalozzi recommended and carried out in his school the practice of having children memorize lists of words. Herbart, von Raumer, and other visitors to Pestalozzi's schools commented on this anomaly. Lists of nouns and adjectives were made up from the dictionary by the teacher and memorized by the children. Pestalozzi said:

These lists of words are placed in the hands of the child, merely as exercises in learning to read, immediately after he has gone through his spelling-book; and experience has shown me that it is possible to make the children so thor-

oughly acquainted with these lists of words that they shall be able to repeat them from memory, merely in the time that is required to perfect them in reading; the gain of what at this age is so complete a knowledge of lists of names, so various and comprehensive, is immeasurable in facilitating the subsequent instruction of children.

This memorized material included such phrases as "slippery, wormshaped, thick-skinned eel," "crawling, amphibious animals," "long-tailed monkeys," etc. In geography the children memorized long alphabetical lists of the names of German towns before studying their locations on the map. Many other examples of such absurd practices could be cited which were utterly inconsistent with the theory of basing all instruction on sense perception which Pestalozzi emphasized as his most important principle.

English books of object-lessons became manuals for memorizing.— It was in England that Pestalozzian verbal formalism was most influential in actual practice, resulting in what Spencer called "the well-conceived but ill-conducted system of *object-lessons*." In an earlier article it was pointed out that one reason why Pestalozzian methods took such a strong hold on English schools was because of the early preparation of a textbook, *Lessons on Objects*, by Elizabeth Mayo (1793–1865) and her brother. This textbook was published in 1830 and was very successful. By 1855 it had reached the fourteenth edition, a copy of which I have examined. It was a veritable little encyclopedia of the arts and sciences. The lessons were arranged in five series. The first series contained simple lists of qualities, for example, in the case of leather, it was stated that it was flexible, odorous, waterproof, tough, smooth, durable, opaque. The second series gave parts of complicated objects as well as qualities; the third series included non-sensory qualities such as *valuable*, and such classifications as *artificial* and *natural;* the fourth series continued the classifications and proceeded to discover analogies between physical and moral or spiritual qualities; the fifth series provided exercises for composition, containing lessons on various chemical substances, on solubility, on the five senses, etc. Finally there was a vocabulary of words beginning with *aromatic*, *adhesive*, *affinity*, and ending with *vitrifiable*, *volatile*, *unctuous*. All of this, according to the title-page, was intended for children from six to eight years of age.

The motive of the Mayos in preparing this text was to provide a method of object-teaching that was not limited by the dearth of suitable objects in the schoolroom, or by the uncertainties of excursions. They realized clearly the danger of the books being used in unprofitable ways. Thus in the Preface it was stated that—

> Those who fall into a mechanical way of giving such instruction, and do not perceive the principle involved, completely defeat its intention, and they had far better keep to old plans and old books.

Miss Mayo intended that the facts should be discovered by the children by an actual examination of the objects, the teacher giving new names where necessary. After advising against too much telling by the teacher she said:

> The writer desires particularly to enforce this remark, having in one or two instances seen the lessons entirely misused. The qualities were told, and the explanation of the terms given, instead of the object being presented to the children that they might make their own observations upon it, and learn from the teacher how to express qualities clearly discovered by them, though unknown by name.

Dickens satirized formal memorizing of Mayo books.—The practice which Miss Mayo said she had seen "in one or two instances" was really very common and led to the following classic satire on these methods by Charles Dickens in his story entitled *Hard Times*.

> Mr. Gradgrind, the town magnate and school patron, is present in the model school of his own creation, where Mr. McChoakumchild surcharges the youthful Coke-towners with grim facts. After a preliminary address to the teachers in this vein—
>
> "Now what I want is facts. Teach these boys and girls nothing but facts. Facts alone are wanted in life. Plant nothing else, and root out everything else. You can only form the mind of reasoning animals upon facts; nothing else ever will be of any service to them. This is the principle upon which I bring up my own children, and this is the principle upon which I bring up these children. Stick to facts, Sir!"
>
> Having thus relieved himself, that his self-love may be gratified by witnessing the triumphs of his own educational scheming, he calls out, by an appropriate management and catechizing, its distinctive features.
>
> Sissy Jupe, Girl No. 20, the daughter of a strolling circus actor, whose life, no small share of it, has been passed under the canvas; whose knowledge of horse, generic and specific, extends back as far as memory reaches; familiar

with the form and food, the powers and habits and everything relating to the horse; knowing it through several senses; Sissy Jupe has been asked to define horse. Astonished at hearing her father stigmatized as a veterinary surgeon, a farrier, and horse-breaker; bewildered by the striking want of resemblance between the horse of her own conceptions and the prescribed formula that represents the animal in the books of the Home and Colonial Society, she dares not trust herself with the confusing description, and shrinks from it in silence and alarm.

"Girl No. 20 unable to define a horse," said Mr. Gradgrind.

Girl No. 20 is declared possessed of no facts in reference to one of the commonest of animals, and appeal is made to one red-eyed Bitzer, who knows horse practically only as he has seen a picture of a horse or as he has, perhaps, sometimes safely weathered the perils of a crowded street-crossing.

"Bitzer," (said Thomas Gradgrind,) "your definition of a horse!" "Quadruped. Graminivorous. Forty teeth, namely: twenty-four grinders, four eye teeth, and twelve incisive. Sheds coat in the Spring; in marshy countries sheds hoofs too. Hoofs hard, but requiring to be shod with iron. Age known by marks in mouth." Thus (and much more) Bitzer.

"Now Girl No. 20," said Mr. Gradgrind, "you know what a horse is."

The methods of the Home and Colonial Infant School Society, mentioned by Dickens, were copied at Oswego, New York, and encountered considerable criticism of a similar sort. Many of the papers on object-teaching published during this period (1860), contain comments on the tendency of teachers to have children merely memorize facts about objects instead of providing real experiences with them.

Proceeding from simple to complex. Favored by Spencer.—The second large group of formalized Pestalozzian practices resulted from the extreme application of the principle that in the process of instruction the teacher should proceed from the simple to the complex. The validity of this principle will be discussed later in this section. It is open to a variety of interpretations. Thus Herbert Spencer states it as the first of the Pestalozzian principles which he would "defend in its entire extent" but rejects the practices which Pestalozzi described for its application. Spencer defended the principle in these words:

That in education we should proceed from the simple to the complex is a truth which has always been to some extent acted upon; not professedly, indeed, nor by any means consistently. The mind grows. Like all things that grow it progresses from the homogeneous to the heterogeneous; and

a normal training system being an objective counterpart of this subjective process, must exhibit the like progression. Moreover, regarding it from this point of view we may see that this formula has much wider applications than at first appears. For its *rationale* involves not only that we should proceed from the simple to the combined in the teaching of each branch of knowledge, but that we should do the like with knowledge as a whole.

Pestalozzi desired to mechanize instruction.—With Pestalozzi this principle was bound up with his desire to mechanize instruction. Describing his work in the second school in which he taught at Burgdorf (1799), Pestalozzi said:

I once more began crying my ABC from morning to night. . . . . I was indefatigable in putting syllables together and arranging them in a graduated series; I did the same for numbers; I filled whole notebooks with them; I sought by every means to simplify the elements of reading and arithmetic, and by grouping them psychologically, enable the child to pass easily and surely from the first step to the second, from the second to the third, and so on. The pupils no longer drew letters on their slates, but lines, curves, angles, and squares.

Shortly after this, when Pestalozzi was explaining his experiments to a visiting French-Swiss official, the latter said, "I see, you want to mechanize instruction." "He had hit the nail on the head," said Pestalozzi, "and supplied me with the very word I wanted to express my aim and the means I employed."

Later, Pestalozzi said that he meant that he desired to psychologize instruction; but the fact remains that what he really did was to reduce much of instruction to a mechanical routine by application of the principle of proceeding from the simple to the complex.

Would organize an alphabet of every subject.—In one of Pestalozzi's last publications, *The Song of the Swan*, he said:

I now came to consider the idea of elementary education from the point of view of means of instruction. From its very nature, it demands the general simplification of its means, which simplification was the starting-point of all the educational labors of my life. At first I desired nothing else, but merely sought to render the ordinary means of instruction for the people as simple as to permit of their being employed in every family. And so in every branch of popular knowledge or talent, I set to work to organize a graduated series of exercises, the starting-point of which was within everybody's comprehension, and the unbroken action of which always exercising the child's powers without exhausting them, resulted in a continuous easy and attractive progress, in which knowledge and the application of knowledge were always intimately connected.

Pestalozzi said that these graduated series of exercises would make teaching so easy that "schools would gradually almost cease to be necessary, so far as the first elements are concerned."

Thorough mastery of each step required.—Closely connected with the practice of using a minutely graduated series in each subject was the emphasis on the mastery of each step or element before proceeding to the next. This notion of thoroughness was another factor in establishing mechanized routine among the Pestalozzians.

The influence of these principles in the teaching of special subjects in the elementary schools was very great, particularly in the case of reading, arithmetic, drawing, writing, and form study.

From simple to complex in teaching reading.—In the teaching of reading the influence of Pestalozzi was to fix and stereotype the synthetic method of beginning with long drills on the letters, then proceeding to syllables, to words, phrases, etc. The first steps in this alphabet-syllable-spelling method of teaching reading, Pestalozzi described in these words:

> The spelling-book must contain the entire range of sounds of which the language consists, and portions of it should be repeated daily in every family. . . . . No one imagines to what a degree the attention of infants is aroused by the repetition of such simple sounds as *ba, ba, ba, da, da, da, ma, ma, ma, la, la, la,* etc.

The spelling-book contained all the possible combinations of vowels and consonants for such drill. After these had been mastered, words were to be learned by spelling them. As was the case in Salzman's school, Pestalozzi provided large movable letters to be inserted in a frame by the teacher as a means of class instruction. These methods were copied in the Prussian schools which were described in Professor Stowe's report to the Ohio legislature in 1839. After telling how the children were drilled on the elementary sounds of letters and syllables till they were mastered, Stowe said:

> They were now prepared to commence reading. The letters are printed in large form on square cards; the class stands up before a sort of rack, the teacher places one upon the rack . . . . [and says], What letter is that? [Pupils answer] *H*. He places another. What letter is that? *A*. I now move these two letters together, thus: *HA*. What sound do these letters signify? *Ha*. [And so on adding a letter at a time, the teacher proceeded until he had formed *hard, hard fist, hard fisted, hardfistedness.*]

In the next higher grade the reading proceeded as follows according to Mr. Stowe:

> The sentence is first gone through with in the class, by distinctly spelling each word as it occurs; then by pronouncing each word distinctly without spelling it; a third time by pronouncing the words and mentioning the punctuation points as they occur [and so on until the sentence is finally read with expression]. Thus one thing is taken at a time, and pupils must become thorough in each as it occurs, before they proceed to the next.

In the Oswego schools, similar synthetic methods were used but with special emphasis on the phonic values instead of the names of the letters.

Study of form, drawing and writing.—Applying the general principle of reducing each subject to its elements, Pestalozzi maintained that the elements of drawing and writing are lines and geometrical figures of various sorts and that long drill in these elements as arranged in his "alphabet of form" should be the first step in instruction. These practices were copied in England and America.

The elements of form with which the children were to be made acquainted occupied sixty pages in N. A. Calkins' *Primary Object Lessons* (1861), one of the best of the numerous books on object-teaching published in America at about the time of the Oswego movement. This included instruction about corners, sides, straight and curved lines, plane and curved surfaces, right, acute and obtuse angles, equilateral and right-angled triangles, perpendicular, horizontal, and parallel lines, the square, rhomb, and parallelogram, pyramids, prisms, cubes, circles, semicircles, circumferences, arcs, center, radius, diameter, cylinders, cones, spheres, hemispheres, and ovals. Calkins' book was largely an imitation of Miss Mayo's which included in addition to the above the tetrahedron, octahedron, pentagonal dodecahedron, icosahedron, rhombic dodecahedron. All of this was to be taught in infant or primary schools and was partly correlated with the teaching of drawing.

The teaching of drawing was to begin with the making of these geometrical figures, starting with various kinds of lines, etc. Spencer, while defending the principle of proceeding from the simple

to the complex, said that he wholly disapproved of this "formal discipline in making straight lines and compound lines." A drawing-book constructed on these principles he denounced as "the most vicious in principle" which he had seen.

Writing was taught in connection with drawing in the Pestalozzian methods. The letters were analyzed into straight, curved, and slanting lines, into acute and obtuse angles, etc., and drill given on these before proceeding to write letters, words, and phrases.

Thorough mastery of elements in arithmetic. Grube method.—In an earlier article improvements in the teaching of arithmetic by applying the Pestalozzian principle of sense perception were discussed in connection with Warren Colburn's *Arithmetic*, published in Boston, in 1821. The Pestalozzian principle of reducing each subject to its elements and requiring thorough mastery of each element before taking up the next was also very influential as applied to the teaching of arithmetic This application was emphasized by a German, Grube (1816–84), in a work published in 1842. Grube was not original in his system of teaching arithmetic. He copied a number of Pestalozzi's characteristics, notably the sense-perception basis, as well as ideas from other sources. The essential characteristic for our present purposes and the one by which the system is most commonly known is the practice of considering each number as an individual, and mastering all the possible operations with it, namely, addition, subtraction, multiplication, and division before taking up the next number. This differs radically from the common practice of first teaching counting, sometimes clear up into the millions, then addition of all numbers, then subtraction of all numbers, then multiplication and division. In as much as Grube began with the number one, which was mastered, before proceeding to number two, and so on up to ten, counting was definitely eliminated. The first year was to be spent on the numbers from one to ten in order, and the first three years on the numbers up to one hundred.

Grube method popularized in America, 1870.—One of the chief influences in popularizing the Grube method in the United States was an essay describing it, read by Mr. L. Soldan before the St. Louis Teacher's Association in 1870. According to its author

this essay was "republished extensively in state and city school reports and educational magazines . . . . from California (see San Francisco Report of 1872) to New Hampshire (see State Report of 1876)." A larger treatment of the subject was contained in *Grube's Method of Teaching Arithmetic*, by Levy Seeley, published in New York, in 1888. According to Professor Smith,

> it thus became . . . . almost the only German "method" known in America. Thus it has come about that Grube has been looked upon as a name to conjure by, and neither the faults nor the virtues (much less the originality) of the system seem to have been well considered.

Grube method unnecessarily thorough.—The Grube method has been severely criticized by the two leading American writers on the theory of teaching arithmetic. Professor D. E. Smith says:

> To know all there is about a number before advancing to the next one is as unnecessary as it is illogical, as impossible as it is uninteresting. . . . . [Two of] the chief defects of the system are these: 1. It carries objective illustration to an extreme, studying numbers by the aid of objects for three years, until 100 is reached. 2. It attempts to master each number before taking up the next, as if it were a matter of importance to know the factors of 51 before the child knows anything of 75, or as if it were possible to keep children studying 4 when the majority know something of 8 before they enter school.

Professor John Dewey, the other prominent critic of the Grube method, says:

> It seems absurd, or even worse than absurd, to insist on thoroughness, on perfect number concepts, at a time when perfection is impossible. . . . . If the child knows 3, if he has an intelligent working conception of 3, he can proceed in a few lessons to the number 10, and will have all higher numbers within comparatively easy reach.

Criticism of proceeding from simple to complex.—Pestalozzi thought he was psychologizing instruction by having the teacher analyze each subject into a graduated series of elements which were to be learned by the pupil in order. He thought that the work of the educator should be analytic and that of the learner synthetic. This implied that the natural process of learning which he was trying to discover, consisted in building up complex wholes from elements which could not be further analyzed.

Pestalozzian theory held by English associationists.—This theory of the way in which we learn was not unique with Pestalozzi.

Many psychologists have believed it. Prominent among these were the whole English school of "associationists" and Herbart, the German follower of Pestalozzi. The subject is too involved to be discussed here in a clear and satisfactory manner, but a little must be said to suggest the recent criticisms of Pestalozzi's fundamental principle. Reference has been made several times to Spencer's discussion of this theory. What he believed is not perfectly clear, but certainly, one of his most important contentions would be rejected by many modern psychologists as being just the opposite of the truth. I refer to his statement that—

> Manifestly decomposable states of consciousness cannot exist before the states of consciousness out of which they are composed . . . . [thus] no articulate sound is cognizable until the inarticulate sounds which go to make it up have been learned.

It was on this theory that Pestalozzi said that the mother should address the infant with *ba, ba, ba, da, da, da,* etc., before she tried to teach him to recognize whole words like "bottle," "mother," etc.

William James rejected associationist theory of learning.—The best criticism of this theory occurs in William James's chapter on "Discrimination and Comparison" in his *Principles of Psychology.* In direct opposition to Spencer's point he says that the child's experience instead of beginning with nicely separated elements is

> one big, blooming, buzzing confusion. That confusion is the baby's universe; and the universe of all of us is still to a great extent such a confusion, potentially resolvable, and demanding to be resolved, but not yet actually resolved into parts. . . . .
>
> Experience from the very first presents us with concreted objects vaguely continuous with the rest of the world which envelops them in space and time, and potentially divisible into inward elements and parts. These objects we break asunder and reunite.

Analysis by the learner prominent in ordinary learning.—As a a rule in the ordinary process of learning, the individual things with which we become acquainted are complex wholes; we recognize, identify, and remember them without completely analyzing them, and may never analyze them unless some practical necessity requires it. Thus in the case of the so-called taste of coffee or

onions, this necessity usually does not arise, and as a consequence we do not ordinarily know how much of the so-called "taste" is really taste and how much is odor. Or to take the example that Spencer suggests, as a matter of fact, the child recognizes spoken words as wholes long before he has gotten separately acquainted with the articulate elements which compose these words. In the same way the child recognizes visual wholes (doors, windows, etc.), long before he has gotten acquainted with the various kinds of lines, angles, and shades of color which are fused in the total experience.

In mastering any new situation or material, for example, in becoming familiar with a strange city, or in solving a geometry exercise, or in studying pictures to determine their artistic qualities, the following process takes place. The mind begins by apprehending the situation as a vague, unanalyzed whole; proceeds by comparison or selective attention to break this whole up into its parts (as far as necessary for the practical purpose of the moment); and then reconstructs (synthetizes) these parts into an organized whole in which the relation of the parts is more or less clearly perceived.

Partly as a consequence of this change in psychological theory, the Pestalozzian methods of teaching reading and drawing by proceeding from simplified elements to complex wholes have been rejected in many places, and methods substituted which are more in harmony with the theory of the psychology of learning maintained by James and his followers.

CORRELATION OF ELEMENTARY SCHOOLS AND HIGH SCHOOLS

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Many superintendents of city schools would be glad to make a close study of the correlation of their elementary and secondary schools if they knew some simple, economic way of recording and tabulating results. Without any recognized method of procedure it seems like a hopeless task to most of them to undertake to evaluate the educational product of each of their various elementary schools through the high school.

The method to be outlined in this article is the outgrowth of a study of the correlation of the Milwaukee public schools. The study was rendered possible by the co-operation of Superintendent Pearse who made the wealth of well-preserved records in that city accessible to the investigator. There were naturally difficulties in organizing the material of such a scope into a simple, compact form. Undoubtedly the plans of tabulation and method of procedure which proved, after more or less experimentation, to be the best suited to such a problem may constitute a suggestive working basis for similar studies in other systems.

The study in question proposed to judge the preparation of pupils from each elementary school upon the basis of the ability exhibited by its pupils to retain their rank or relative position in the high school. That is, if a pupil has taken high rank in the elementary school, does he continue in the highest rank in the high-school class to which he is promoted?

The use of rank instead of absolute marks as the basis of all comparisons is very important for two reasons. In the first place, the group of pupils who never enter high school ought to be considered. If the pupils who go to high school from any given elementary school are not truly representative—that is, about equally divided between poor, average, and superior pupils—this

fact will be taken into consideration in the investigation by using the marks of all the original eighth grade to determine rank in that school. What is the wisdom in comparing two schools on the basis of the future marks of their pupils in high school if one-half of the pupils from one school were originally in the lowest division of the class and only one-tenth of the pupils from the other school came from the lowest division of the class? This difference in representation existed in two schools in Milwaukee and the difference in many cases was quite marked. Some schools did not have any of their poorest pupils going on to high school and, on the other hand, several schools had as many go from the low as from the high third of their classes.

The second important reason for the use of rank is found in the lack of uniformity of marking. The teacher whose pupils received the lowest marks in arithmetic (only one-third of the class got a mark above 78 per cent) must have marked very low, for the ability of her pupils was shown by an excellent record in mathematics in high school. More detailed illustrations of the lack of uniformity of standard will be given later. There is sufficient evidence to convince one that absolute marks may easily be misinterpreted by the high-school teacher if he attempts to gain any idea of the ability of pupils from different schools by the absolute marks used by different teachers.

ELEMENTARY-SCHOOL GRADES AND RANK

Elementary-school marks were taken from thirty-nine schools. In order to make this a comparative study, the entire outgoing class of a given year was taken as the basis for the study. There can be no doubt but that all of these pupils had pursued the same course of study in the elementary school and would have the same texts and subject-matter in high school. A class that graduated from the eighth grade in June, 1907, was selected, so that the progress of those entering high school could be followed for a considerable time. There were report sheets showing the marks, in a numerical percentage system of each pupil in all of his subjects.

(The scope of this article precludes a detailed description of the system of records as kept in Milwaukee and the minor details of technique in arranging this material.)

The marks in reading, arithmetic, language, and German were selected as typical. In each of the subjects the pupils were arranged in the order of superiority as indicated by the teacher's marks. Lines were then drawn marking off the third of the class having the highest marks, the third having medium marks, and the third having the lowest.

The special method used in tabulating these data is illustrated by the distributions of arithmetic marks for three schools in Table I.

TABLE I

	70	71	72	73	74	75	76	77	78	79	80	81	82
School 16	// / / / / / ///			//	/		//	//	//		// //// /////	///	/ /// ///
School 14	/ / // /	///	/ / // /	///// /	/ /// / /	//	/ / /	/	/	/	/ /		
School 7	/ / / //	/	/ / / //	/		/ / /	/					/	/ / //

TABLE I.—*Continued*

	83	84	85	86	87	88	89	90	91	92	93	94	95	96	97	98	Totals
School 16	/ /// / //	/ //	//	// //	/ //	/ //	//	/ /	/ /	//	/ ///		/				=24 =49 73
School 14	/	/	/ /	/	/ //	//	/							/			=21 =22 43
School 7	/ / /	/	/	/	/	/ ///	//	/ ///		/		/	/		/		=13 =20 33

Every numerical percentage from 70 to 100 has a separate vertical column. There are also four groupings for lower marks. The record for each school is placed on a double horizontal column. The lists had been previously checked to show which pupils entered high school in the following autumn. These pupils were differentiated from the others by placing their record on the lower half of the column. It is a simple matter to take a list of final marks

for a class in a given subject and represent the mark of each pupil by a tally in the column designated by that per cent and, at the same time, keep the records of the high school and non-high school separate.

This form of tabulation serves several purposes: (1) With all the data on one sheet, totals can easily be obtained showing the distribution of marks for the entire city. And the total can be obtained either for those who went to high schools or for those who did not, as well as for the entire class. (2) It affords an excellent opportunity to compare in a graphic way characteristic features such as (*a*) a preponderance of marks in the upper or lower range of the scale; (*b*) a wide or narrow range of marks given; (*c*) an unusual use of certain marks, and (*d*) the difference between the marks of those entering high school and those who did not. (3) An intensive study can be made of each school. The plan facilitates the work of determining the rank of each pupil.

The entire class of each school is divided into three groups or tertiles, as nearly equal as possible on the basis of position in the scale of marks. For instance, if we establish three divisions or tertiles to determine high, middle, and low rank in arithmetic in School 14 (see Table I) there will be fourteen pupils in each tertile, with an extra one in the middle group. Heavy vertical lines are used to designate the limits of the tertiles. After the middle range—the inclusive percentages of the middle tertile—is known, the rank of each pupil may be set down opposite his name.

The example given in Table I also shows the impossibility of dependence on absolute marks. Pupils receiving a mark of 80 to 81 per cent in School 14[1] would be in the highest tertile (first mark); the pupils getting these marks in School 16 would be in the middle tertile, and the same marks would place pupils of School 7 in the lowest tertile. "Yes," someone may say, "That may not show that standards of marking were different but that there was actually a corresponding difference in the ability of the pupils in the different schools." The latter part of the study shows conclusively that

[1] The numeral used here to designate a school does not correspond with the numeral employed in the Milwaukee system but is part of a simplified system used throughout the study.

such was not the case. When the rank of the pupils in arithmetic was compared with their rank in algebra it was found that a greater percentage of School 14 (the school which gave the lowest marks) excelled in maintaining their original rank or increasing it. In fact there was a complete reversal of things from what the absolute marks alone might indicate. School 14 with a middle range 71–78 had 61 per cent of the pupils in algebra remaining in the relative position they had in the elementary school, while School 16 with a middle range 79–84 had 56 per cent remaining in their original rank, and School 7 with the highest middle range had the lowest retention—only 44 per cent.

HIGH-SCHOOL GRADES AND RANKS

The high-school rank which was used in these comparisons was determined in the following way. The distribution of marks for the whole class in the high school and divisions into tertiles was made just as with the elementary data. A pupil's rank in this case is his relative position among all of the Freshmen in his high school.

It is a good plan to transfer the high-school records of all pupils considered to individual cards which have spaces also for elementary marks and rank. And it is well for comparative purposes to have the data from one school placed on the right side of the card and that of the other school on the left. In this way subjects of natural sequence or close relationship can be placed in close juxtaposition. Thus arithmetic and algebra can be compared. Then the cards can be shuffled to arrange the material with reference to any problem that may come up. Most of the time the cards of pupils from each elementary school will be kept together in one group; sometimes the point of interest may require a grouping by high schools; or a separation of those failing may be needed in order to make a special study of them; or again, those irregular in other ways may be selected for special study.

The material in some form like this may soon be the starting-point of studies in correlation. The work involved in the preliminary steps of a study using existing material is necessitated by our failure in the past to recognize the value of continuous records.

One could take the cards from any school, if made according to the suggestion above, and by a careful examination get a good general impression of its correlation with the higher institution, or of any marked peculiarities of its pupils as a group. But there is need for a more concise definite and graphic tabulation of results, especially if a superintendent is to make close comparisons of schools.

All of the material for any correlation can easily and simply be represented "on the square," as shown in Tables II, III, and IV.

TABLE II

SCHOOL 18—ALGEBRA

	1st	2d	3d	Total
Arithmetic— 1st	/////	/	/	(7)
2d	//	//		(4)
3d		/////	//	(7)
Total	(7)	(8)	(3)	

TABLE III

SCHOOL 17—ALGEBRA

	1st	2d	3d	Total
Arithmetic— 1st	////// ////	////	//	(16)
2d	//	///	// /////	(12)
3d	/	///	/ /////	(10)
Total	(13)	(10)	(15)	

These show retention and fluctuations of rank in mathematics for pupils of three different schools of Milwaukee. Each individual is again, as in Table I, represented by a tally. The small square in which this tally is placed depends upon the pupil's rank in arithmetic and in algebra. His rank in the elementary subject

will determine in which horizontal column the tally will be placed, but at the same time the tally must have position in a vertical column. The vertical column shows the pupil's rank in the subsequent high-school subject. To illustrate, a rank of first in both is represented in the upper horizontal and first vertical column; a rank of second in the elementary and third in the high-school subject is denoted by a tally in the second horizontal and third vertical column.

With just a little practice one can see all of the significant features at a glance. It is evident that a diagonal line from the upper left to the lower right corner would pass through the three spaces which indicate that students hold in the high school the same

TABLE IV

SCHOOL 4—ALGEBRA

	1st	2d	3d	Total
Arithmetic—1st	//// /////	/		(10)
2d		/////	//	(7)
3d		/	//	(3)
Total	(9)	(7)	(4)	

rank that they had in the elementary school. The three small squares below the imaginary diagonal show the gains in rank—from second to first; third to second; and from third to first. The corresponding squares above show losses in the reverse order.

School 4 is an example of a school that has good retention—only four have shifted from the rank obtained in the elementary school and no one has fluctuated more than one point. School 18, on the other hand, shows many gains in rank; while School 17 has a preponderance of losses.

The question of the kind of representation from each school is clearly set forth on this diagram. The group from School 18 is very representative of the original class. On the basis of their early work we could expect about seven pupils in the lowest tertile

in high school. School 4 has more pupils in this low tertile and yet had comparatively very few of their poor pupils enter high school (three out of forty-two). The people who are satisfied with knowing only what kind of marks each delegation made in high school can see at a glance whether the right or the left side of the square has the most tallies.

The foregoing correlations in single subjects may be compiled into a composite card upon which all the correlations in all subjects are recorded for a given school. The same card may be used to record the withdrawals from the school. The general plan devised for this larger "school card" is shown in Table V. It shows the correlation in the sequences, reading and English; language and English, arithmetic and algebra, reading and Latin, language and Latin, and in elementary arithmetic and commercial arithmetic. The first three are the more important in considering

SUMMARY SHOWING RETENTION AND GAINS AND LOSSES IN RANK

Subject	Same	G. 1.	L. 1.	G. 2	L. 2
Reading and English	11	5	8	0	0
Language and English	12	4	7	1	0
Mathematics	18	3	3	0	0
Language and Latin	5	0	3	0	1

only a single class because the number of individuals taking the electives such as Latin and commercial arithmetic is often small. (The last correlation mentioned above is omitted in the accompanying summary.)

Such a card in addition to accumulating all the data for a given school offers an excellent opportunity to compare retention in different subjects.

There are several well-marked cases of the same group of pupils showing better preparation in one study than in another although they have been taught by the same teacher. The reason for such a condition may be perfectly obvious in any given case. For instance, a school in a foreign section of the city would often have difficulty with English. But there are in any system teachers who slight some subject that they do not like or in which their preparation is weak. When it is shown definitely that her pupils

TABLE V

SCHOOL 20

	English			Algebra			Latin			Failures	
	1	2	3	1	2	3	1	2	3	1" Sem.	2" Sem.
Reading—											
1	//////|	///////|				//	/	///	L.	
2	//	//	/				/		/		E.
3		///	///						/	L.E.	E.
Arithmetic—											
1				///////	///						A.
2				/	//////						
3					//	/////				A.A.	A.A.
Language—											
1	//////	/////					///	/	/	L.	
2	/	////	//						//		E.
3	/	///	//						//	L.E.	E.E.

differ materially in preparation in different subjects it will be much easier to remedy the situation.

The double column at the extreme right of Table V needs some explanation and deserves some comment. Initial letters are used to show each failure in a given subject. Their position indicates in which semester the failure was made and the original rank of the pupil making the failure. This last point is usually overlooked but is vitally important in a comparative study of the efficiency of schools. Let us take an illustration which shows the bearing of this information on the question of failures—or rather "judgment by failures." One school in this study had six pupils fail in high-school mathematics. There is nothing alarming about that, some other schools had as many. But the tabulation shows that three of the pupils who failed came to high school with marks which indicated that they were the best of their elementary class; the other three came from the second or middle tertile. There were no failures from the lowest tertile because none of their poorest pupils had elected to go to high school. It is more to the discredit of a school to have six failures under those conditions than it would be to have six of its poorest pupils fail—pupils recognized as poor and labeled that way before they entered the higher institution. The illustration given is an extreme case, but there was an unwarranted number of failures from the higher tertiles of some schools. Such failures were rare in schools that were shown to be better in the point of retention.

The results found in any system by such a method of correlation as the one here outlined will show that there are differences between the different elementary schools. Whether the particular condition in any school is due to some cause inherent in the constituency of that school or to the plan of organization of the school and the quality of instruction given is a matter for further investigation. But as long as a deficiency in any respect is unknown or merely a matter of conjecture and not an established fact there is little hope for the betterment of that condition. Facts of the type above reported certainly have this importance, that they make clear to any principal in a wholly impersonal way the problems which he ought to face as a member of a school system.

A CITY SCHOOL AS A COMMUNITY ART AND MUSICAL CENTER

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It appears that a considerable amount of leisure is normal for the human race, whether savage or civilized. Under the primitive conditions in which man's nature was originally shaped, his struggle for existence was by no means continuous, especially in easy climates. Yet the struggle made it necessary that he possess a supply of energy sufficient to overcome all hostile forces during the period of greatest stress. The result was that during the periods of relaxed struggle, he possessed a very considerable surplus of energy that had to be expended in leisure occupations. In our recently developed civilization the struggle has been still more relaxed and regulated, with the result that most social classes have acquired a relatively large amount of leisure. This is especially the case during the last few decades, when the burden of heavy labor has been transferred from human shoulders and placed upon labor-saving machines. The great mass of the people are emancipated from heavy labor for a considerable portion of the day. Where workmen are engaged eight hours a day or forty-eight hours per week, after allowing twelve hours a day for sleep and meals, there yet remains a surplus of thirty-six hours a week to be devoted to leisure occupations. This is three-quarters of the time given to regular economic industry. It is the portion of the man's time that is most subject to his own disposition, and it is also probably the portion of his time for which he needs the greatest amount of education unless he happens to be of the managerial class. As a workman, he has directors, foremen, superintendents. As a citizen he has political leaders to direct him, and teach him what is to be done, as he goes along. As a parent he has the school to advise him as to the training of his children and the physician to advise him as to the health of the family. But in the matter of

recreation he is free to do as he will, and this is therefore the region in which men most easily go wrong. Moral education probably consists for the most part in education for the right use of leisure.

Recognition of these matters is responsible for the extremely rapid development of civic, social, and recreative centers in our larger cities and for the wider use of the school plant by the community. The activity of these centers consists for the most part of healthy, leisure occupations—quiet games, athletic games, the gymnasium, the swimming-pool, the library and reading-room, public lectures and entertainments, and the like.

Among leisure occupations of a healthy sort there is certainly none of a wider appeal than music. Its power is recognized by both the forces of good and the forces of evil. It is one of the chief attractions both of the church and of the saloon. In fact, wherever men are gathered together, the pleasures of social intercourse are greatly heightened by the influence of stimulating and appropriate music.

Notwithstanding this almost universal appeal of music, it has been given relatively little attention in the development of our social centers. In Perry's book on *The Wider Use of the School Plant*, for example, in a very complete index of twenty-seven pages, "music" is not to be found. It is employed certainly in the social centers since chorus classes are not infrequent, pianos are common, and occasionally the center has an amateur orchestra that furnishes the music for dancing, for theatricals, and for other special occasions. But the music in these cases is subsidiary and is used not for its own sake or for the development of the musical appreciation of the community, but rather as an aid to other activities.

It is probable that the reason for this neglect in large measure lies in the presence of a number of obstacles of a serious sort. Professional music is expensive as compared with other forms of healthy activity that can be introduced; and the musical traditions of the community are usually so little developed that a permanent, reliable, amateur orchestra can scarcely be developed to the proper extent, or held together if once developed. Such traditions are matters of long and slow growth. But fortunately

when once developed within a community, they are as difficult to eradicate as they were to cultivate.

An example of what is possible in the use of a school as a musical center for the community is afforded by the city of Richmond, Indiana. This is a small manufacturing city of less than twenty-five thousand inhabitants, not greatly different from scores of other cities of similar size scattered throughout the Middle West. The city is fortunate in having had a rather slower and more substantial growth than most cities of its size, and in the possession of a number of public-spirited men and women of literary, musical, and artistic tastes and ability.

Its school system is not greatly different from the usual type. It consists of a number of ward-school buildings containing the elementary grades from the first to the sixth. This is followed by the junior high school, as it is called, centrally located, containing all of the seventh- and eighth-grade pupils of the city. At the head of the system is the usual high school. This is housed in a new, modern, fireproof building, located within two blocks of the heart of the city. In the choice of a site for the new high school, consideration was given to the fact that it was to be the chief social center of the community. For this purpose it is provided with an auditorium capable of seating almost a thousand people, and provision has been made for enlarging this auditorium by the removal of partitions whenever the growing need demands it. The auditorium is placed on the first floor at the front of the building, making it easy of access from the street. It is freely open to the public for all sorts of purposes except those of a commercial or partisan nature.

This auditorium is the musical center of the city. It is the meeting-place of four musical bodies: (1) The People's Symphony Orchestra, which meets in this auditorium for four hours' rehearsal and public concert every Sunday afternoon from October until May; (2) The People's Chorus, consisting of some two hundred and fifty voices, which meets regularly one evening per week through the year; (3) The High-School Chorus; (4) The High-School Orchestra, which furnishes the music for the school assembly meetings and for other school gatherings.

The Symphony Orchestra is a local organization of sixty-five members containing all the instruments of the usual, well-developed symphony orchestra. Thirty-five of its members are also members of the High-School Orchestra, or are recent graduates of the high school. This orchestra of sixty-five is a considerably larger body of players than Theodore Thomas had when he made his name famous in the seventies and the eighties. Yet they are young men and women native to the place and educated in its schools. They furnish the city in a voluntary way with a quality of music that is not usually to be found outside of our largest cities where it is usually so commercialized as to be inaccessible to those most in need of development along lines of artistic appreciation.

The larger city orchestra grew out of the high-school orchestra which still continues to be its nucleus, and the leader of which has been the guiding spirit of all of the community, musical movement. The High-School Orchestra consists of fifty-four members with an instrumentation as follows:

10 1st violins	2 basses	2 bassoons	1 timpano
10 2d violins	5 flutes	8 cornets	1 drum
2 violas	2 oboes	2 horns	1 piano
2 cellos	5 clarinets	1 trombone	

Most of the instruments are owned by the students, but a number of the expensive instruments that are of little use except as parts of the orchestra have been purchased for the school by the community. The initiative was taken by the Commercial Club of the city which has been very generous in the support of the movement. Other instruments have been furnished by the Board of Education. This board has been more than usually generous, not only in supplying instruments but also in supplying a teacher qualified to direct and lead in the musical work not only of the schools but also of the larger community. The director of the music is, for example, the most highly paid teacher in the city system, his salary being in fact only a little less than that of the city superintendent of schools. Thus, music in the high school receives as much care as mathematics or science or literature and is credited toward graduation in the same way.

The High-School Orchestra was organized some twelve years

ago. For eight years the high school has been turning graduates out into the community who are trained in skilful execution and in musical appreciation. In this way the school has been developing musical traditions in all ranks of the community.

The feeder for the high-school body of players is the junior high-school orchestra consisting of seventh- and eighth-grade students. This is the place where they try them out for the first time and gather together all of the players of promise, both boys and girls. By the time they reach the high school, they have "found themselves" on some instrument and have already had two years' training in co-operative instrumental exercise. The instrumentation of the junior high-school orchestra of last year shows the nature of its work:

4 1st violins	1 flute	2 cornets	2 drums
4 2d violins	2 clarinets	1 horn	1 piano
1 bass	1 trombone		

With this preliminary two years of training in the junior organization, the fifty-four orchestral members of the high school when they graduate go out into the community having had some six years of systematic, instrumental training. They have reached such a stage of proficiency and appreciation that they naturally feel a desire for continuing their activities after they have left the high school, and have entered upon their vocation. And thus the voluntary adult Symphony Orchestra is the logical result of the work of the schools.

Besides the instrumental work the high school offers four years of vocal music for which due credit is given toward graduation. There is a two-year course in harmony, two years in critical study of music, and chorus practice of an indefinite amount through the four years of the high school. Mr. Earhart, the musical director, in speaking of these courses, says: "The 'critical study' classes have for ten years past been turning into the citizenship of the town a body of young people who are more than usually informed on such facts of musical history, biography, form, and aesthetics as contribute to a sympathetic and discriminating understanding of music. These young people have also learned to sing and to

read not only the notes but the quality, mood, or meaning back of the notes. I begin to notice in consequence greater intelligence, quicker grasp, and greater love for the work on the part of the chorus-singers. The addition of chorus singing to the curriculum and the greater number of hours given to the cri ical study work in the high school will hasten our progress in this direction. And I should not omit mention of the harmony classes. Many of our best chorus-singers and orchestral players owe a large part of their superior efficiency to the thorough musical understanding that two years work in harmony has given them."

The development in Richmond shows what is possible in any city. It also shows the need of slow, substantial growth, and that these things will not grow of themselves. One sees that in the wider use of the school plant where the music is subsidiary only or omitted, this is because it is a form of activity not to be developed in a day or a year. The schools must turn out a community of individuals who are filled with the necessary traditions and appreciation, and who are trained in the confident, skilful execution that can come only with years of steady, systematic training. This is not to be done without a teacher who is willing to work for years till his end is reached, irrespective of the hours consumed by his daily labors; one who is well paid but who does not measure his work by his pay. The teaching must be with the spirit not of the pedagogue but of the artist. And in the undeveloped stage of musical traditions in our country, such teachers are rare.

Such a delevopment is needed for the civic, social centers everywhere. Nothing less will ever be able to offset the attractions of the saloon, the beer-garden, the dance-hall, the low-class music-halls so-called, and other debasing social agencies, all of which use music of some sort as one of the chief sources of attraction. City libraries attract relatively few; public lecture courses reach only certain limited classes. One visits the civic facilities furnished by the small parks system of Chicago, which, by the way, is probably the best of its kind in the world, with distinct feelings of disappointment. The facilities for healthy recreation of many sorts are furnished by these parks and yet the adults of the type that most need them are not there. It is to be noticed, however,

that when music is employed as the attractive influence, the park facilities are found inadequate for the demands.

"What our people need," a musician recently said to me, "is to hear music, and to hear music. They must hear it regularly for months and years in order to develop a proper appreciation of proper music. It does not greatly matter what kind they hear in the beginning or what kind they demand. Experience has shown that where people hear music regularly their tastes develop, and they acquire an appreciation for a continually better and better quality. The main thing is that they should hear it." Mr. Earhart told me that he has permitted the members of the high-school orchestra a considerable voice in the choice of compositions to be played, and that while in the beginning there were frequent requests for compositions of the crude, popular order, at the present time the students very rarely care to experiment with anything except music of the better type. And he was of the opinion that when the community has opportunities to hear all kinds of music that it will gradually come to prefer music of the better quality to that of the poorer quality; and standards of appreciation once developed do not deteriorate in the particular individuals in whom developed.

Music is used as a leisure occupation by two classes of persons, the players or singers, and the auditors. The leaving of musical education in our country almost wholly to private initiative has resulted in the musical education of such a relatively small proportion of the population that all or most of the well-trained individuals have been drawn off into professional music; and this has left the community without musical leadership. But the experience of Richmond, in giving in her schools a completer form of musical education than most of our cities, has shown the possibility of developing large and stable, amateur, musical organizations of a superior type. And where such individuals exist in so great numbers one can conceive of no leisure occupation that could be more attractive to them than the exercises and personal associations within such voluntary organizations, furnishing the community at the same time with a superior kind of music as a by-product. In the present agitation for physical education, it

ought also to be remembered that there are few forms of in-door, physical exercise so beneficial as the vocal exercises of an enthusiastic People's Chorus.

This high school is not only the community center for music, but also for pictorial art. In the construction of the new high-school building three large rooms on the top floor were set aside as the city's art museum. Art exhibitions are frequent in the city and they are held in these art rooms. A number of valuable pictures have been contributed to the school by various members of the community. The school itself has purchased a number. Public-spirited citizens, the owners of valuable pictures, have hung many of them in the art room of the high school for the sake of aiding in the development of a general appreciation of this form of art. For four years during their most susceptible period, the youth of the community live under the influence of the best art that the city is able to procure. An occasional visit to a city art museum is probably of little value in the development of appreciation where the influences are so tenuous and the individual left so passive. One must live with pictures if his spirit is to be transfused with the spirit of their art. For this reason the method of using the city school as the art museum of the city is incomparably more effective than the method of placing all the pictures in a separate city art museum to be only occasionally visited by the few, and by most of these to a degree wholly insufficient for the development of any considerable degree of appreciation. Richmond believes that her art should be a thing functional in the lives of her people and not merely a thing to be set apart and occasionally admired. So far as an art museum is for the education of artists primarily it is well for the city to possess one. But so far as the city art museum is intended for the education of the community in the appreciation of pictorial art, it would be far better if the pictures and statues of the city art museum were scattered through the various schools of the city. Especially would it be effective if they were scattered among the high schools, since it is during the adolescent period that art has its greatest initial appeal, when the growing individual is most susceptible to its influence, and when his appreciations and attitudes are most modifiable by its presence.

STANDARD SCORES IN ARITHMETIC

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Detroit Home and Day School

For the attainment of efficiency in any manufacturing process three things are necessary: a well-defined, a "standard," product; a knowledge of the properties and possibilities of the material to be acted upon; and a means of measuring the effects produced by the process itself. Given these three, all else is but a matter of trial and selection.

Education, from one point of view at least, is a manufacturing process. The raw material that is sent to a school is molded and shaped by the forces and experiences to which it is subjected. Marked changes are effected and the product has, in a general way, a commercial value that bears some relation to the complexity of the process and the degree of change produced. In a graded system promotion from grade to grade emphasizes the idea of "degree of change," of grade standards. Promotion from the fourth to the fifth grade, for instance, is dependent upon the acquisition of a certain amount of knowledge, the attainment of a certain degree of skill. In an efficient school one does not expect to find children of fourth-grade ability doing eighth-grade work. Each higher grade reached is supposed to mean a correspondingly higher level of ability.

The attempts of the writer to measure the efficiency of the teaching and the growth of the arithmetic classes under his control in the Liggett School have been described in some detail in previous numbers of this Journal. That work gave some knowledge of the nature of the material to be acted upon in school work, and proved that it was possible to measure accurately the changes produced by teaching effort. Clearly defined standards alone were lacking. The present article will deal with an attempt to determine such standards from the measurement of a large number of children.

Because of the complexity of the problem, the scope of the

investigation was limited to the simplest work with whole numbers in the four fundamental operations. The tests used were in all essential particulars like those previously described, and will not be discussed in detail. It is sufficient to say that in their construction the utmost care was taken to eliminate the imperfections of previous tests caused by the inequalities of the units. The subject-matter of the tests, eight in number, was as follows:

Test No. 1. Addition
Test No. 2. Subtraction
Test No. 3. Multiplication
Test No. 4. Division
(Combinations, 0–9)

Test No. 5. Copying figures (rate of motor activity)
Test No. 6. Speed reasoning (simple one-step problems)
Test No. 7. Fundamentals (abstract examples in the four operations)
Test No. 8. Reasoning (two-step problems).

The nature of the investigation made it essential that the tests should be given to all grades from the lowest to the highest under identical conditions. To this end detailed instructions for every phase of the work, together with special record sheets, answer cards, etc., were printed in the form of folders to be put into the hands of each examiner or scorer. As experience had shown the most probable source of error to be faulty timing, the time allowances were printed in red. In addition a personal letter of warning was sent with each package of tests. It is realized that no degree of care can prevent either accidental errors, or deliberate fraud, but the testing of many schools tends to eliminate the effects of the first, and the character of the persons who took part in the work makes the second improbable. A few cases of accidental errors were reported, and for these tests either due allowance has been made or the results rejected entirely. The writer believes the precautions taken to have been effective; and that the conditions under which the tests were given were sufficiently uniform for the results to reflect accurately the actual conditions. Check tests of several grades under absolutely uniform conditions and with mechanical timing have yielded similar results.

The co-operation of many persons was secured by letters to personal friends, by circulars, and by editorial notice in this and two other magazines. For the kindness of these notices the writer

is very grateful. It not only brought the matter to a wider circle of interested persons than could have been reached without it, but it also gave the investigation a standing it would have been hard to secure in any other way. As a result inquiries were received from many parts of the United States and from several foreign countries. The total of requests and orders for tests exceeded 30,000 copies. Ten thousand sets of tests were distributed free and eight thousand more were sold at the bare cost of printing. Teachers in England and Germany were interested in the work and the tests have been, or are to be, given in those countries also.

From the above it must be evident that the undertaking owes its success to its co-operative features. While the writer alone is responsible for whatever defects there may be in the tests themselves or in the planning of the work, credit is due the many who executed the plans and bore the burden of giving and scoring the papers. The writer is very glad of this opportunity to express his grateful appreciation of the assistance rendered by all those whose generous support and careful work has made this article possible.

Fire, accidents, sickness, and unavoidable delays of many kinds have prevented the completion of the work by many to whom the tests were sent. The tabulations of this article are based upon the returns received from some sixty or seventy schools in ten different states as shown below.

CONTRIBUTORS TO STANDARD SCORES

State	City	Name
New Hampshire	Littleton	D. F. Carpenter, superintendent
Massachusetts	Dorchester	A. R. Winter, sub-master, Mather School
	Fitchburg Leominster	E. A. Kirkpatrick, head of Department of Psychology, State Normal School
New York	New York City	H. C. Pearson, principal of Horace Mann School
		Miss Margaret Eves, acting supervisor of Elementary Mathematics, Ethical Culture School
	Brooklyn	J. C. Bell, Psychology, Training School for Teachers
	Hastings-on-Hudson	W. R. Williams, principal

CONTRIBUTORS TO STANDARD SCORES—*Continued*

State	City	Name
Delaware	Dover	A. Crawford, principal
Maryland	Salisbury	W. J. Holloway, county superintendent
Virginia	Farmville	C. W. Stone, Department of Education, State Normal School
		Miss Mary D. Pierce, supervisor in Practice School
	Williamsburg	H. E. Bennett, professor of education, College of William and Mary
	Toano	
Michigan	Detroit	A. Cotter, principal, Harris School
		W. C. Martindale, superintendent
		Misses Liggett, principals, Liggett School
	Kalamazoo	S. O. Hartwell, superintendent
Indiana	Marion	J. T. Giles, superintendent
	Fort Wayne	Miss Flora Wilber, principal City Normal School
	Bloomington	H. L. Smith, superintendent
Missouri	St. Joseph	Miss Fannie Brennen, principal Garfield School
Kansas	McPherson	G. G. Pinney, superintendent

In the list that follows the number of tests sent to each of the above is given that some idea may be had of the sizes of the different groups of children measured. There is no correspondence, however, between the order of schools in the two lists. The number of actual individual scores returned for tabulation was a little over 9,000 for most of the tests.

Number of tests sent to the individuals in the list above:
2500, 1600, 1400, 1000, 750, 650, 500, 380, 350, 350, 350, 300, 200, 200, 196, 150, 140, 120

Total 12,171

A record sheet for the scores of each individual measured was sent out with each set of tests. These, when completed, were returned and will be used, later in the year, as the basis of tabulations to determine standard scores by age, and the correlation between the abilities measured. For each grade, a copy of the grade record sheet was also returned. Upon this was shown the

distribution of the scores of the individuals composing the grade. Tabulations of these distributions are the bases of the tables below.

For instance, returns were received from fifty eighth-grade classes (both A and B). The distributions of the classes having the highest, median, and lowest grade averages are given in Table I; also the total of the distributions of the entire fifty classes. The same facts are shown graphically in Fig. 1.

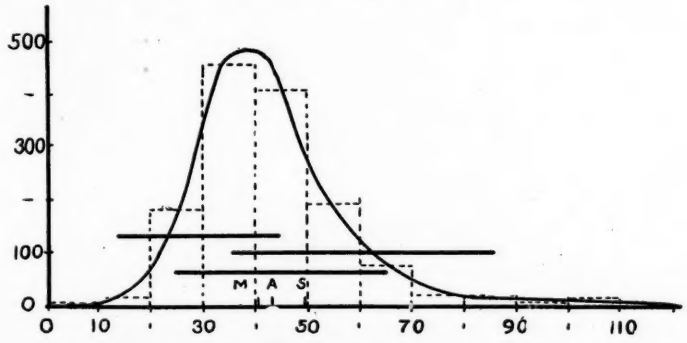

FIG. 1.—Distribution of 1,400 individual eighth-grade scores. Scale at bottom of figure gives number of answers written per minute in test of multiplication tables; scale at left gives frequencies. Solid horizontal lines show range of individual scores in the classes having the lowest, highest, and median grade averages of the fifty classes contributing the individual scores. M = median score of the entire group = 41; A = average = 43; S = score selected as standard for the grade = 49.

In words the meaning of the table is that of 1,401 eighth-grade children measured as to their knowledge of the multiplication tables, 2 could write answers at a rate of but 5 answers a minute,

TABLE I

DISTRIBUTION OF INDIVIDUAL SCORES IN SPEED TEST, MULTIPLICATION

Three Representative Classes; also Total of Fifty Classes; Eighth Grade

	No. in Class	Scores											
		0–9	10–19	25	35	45	55	65	75	85	95	105	115
Highest	36	...	.....	..	4	5	6	13	4	4	..	...	...
Median	43	...	.....	4	18	16	3	2	..	..	..	...	...
Lowest.....	13	...	1	6	5	1	..	..	..	..	..	...	...
Total	1,401	2	17	180	460	410	191	77	26	22	5	10	1

17 at the rate of 15 answers a minute, 180 at 25 per minute, and so on, the average for the entire group being 43.

It is particularly to be noted that the wide range of the distribution is caused not so much by great differences between schools as by great variation in the abilities of individual children. The amount of variation in the grade averages of different schools

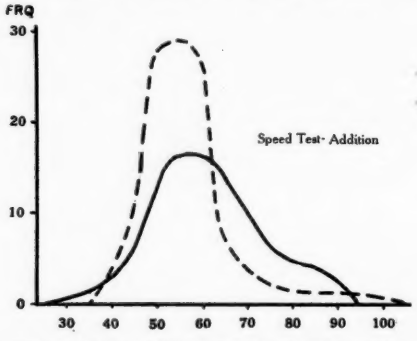

FIG. 2.—Comparison of the distribution of fifty eighth-grade averages with that of forty-seven individual scores in a single eighth-grade class. Solid line, individuals; broken line, classes. The curves show that the individuals in a single class differ more than the grade averages of the fifty schools.

does not equal the variation in the scores of the members of any one class. Table II and Fig. 2 show this plainly. The distribution of an average class of 47 members (selected from the 9 classes of the 51 having a membership of from 42 to 51) is given for comparison with the distribution of the 51 grade averages. The results are from the scores in the addition speed test, for many schools the ability in which the *least* variation was shown.

TABLE II

SPEED TEST, ADDITION: EIGHTH GRADE

Comparison of Distribution of 47 Individual Scores in a Single Class of Average Variability with the Distribution of the Grade Averages of 51 Classes

	No.	Scores						
		30–39	45	55	65	75	85	95
Individuals	47	1	6	16	13	7	4	..
Classes	51	..	11	29	7	2	1	1

The fact shown is a constant feature of the returns for all the tests and grades, and can only mean that the differences in the abilities of individual children are greater factors in determining relative rank in school work than all the differences in abilities of teachers, courses of study, or methods of work combined. The result is that the grades in all the schools overlap to an extent well-nigh incredible, and thus the data from this more extended investigation fully confirms the conclusions reached in a discussion of this point in a previous article, although in that case the data was derived from a single school.

TABLE III

GRADE AVERAGES FROM TOTAL DISTRIBUTIONS

GRADE NO.	AVERAGE OF SCORES FOR EACH TEST	No. 1	No. 2	No. 3	No. 4	No. 5	No. 6		No. 7		No. 8	
							Ats.	Rts.	Ats.	Rts.	Ats.	Rts.
1	55	6	6	..	..	29	...	...	....	....	...	...
2	75	21	12	10	12	51	...	...	....	....	...	...
3	525	26	19	16	11	63	2.8	2.1	5.4	1.7	2.7	0.6
4	1,222	33	25	23	21	70	3.7	2.5	6.6	3.6	2.6	0.8
5	1,177	40	32	30	28	80	4.4	3.4	9.0	5.3	2.8	1.2
6	1,282	46	37	34	35	88	5.1	4.4	10.3	6.9	3.4	1.7
7	1,432	51	40	38	38	98	5.9	5.2	11.5	7.6	3.7	2.2
8	1,370	57	45	43	44	102	6.8	6.1	13.1	8.9	4.1	2.7
9	412	59	47	45	47	108	6.9	6.4	13.7	9.5	4.1	3.1
10	216	57	45	43	46	112	7.2	6.7	14.0	9.5	4.1	3.1
11	151	59	47	44	48	114	7.9	7.4	14.4	9.4	4.5	3.3
12	169	61	48	44	49	112	7.7	7.2	14.9	10.8	4.6	3.6
13	462	71	56	50	56	116	8.6	8.2	16.8	12.6	5.3	4.0
14	131	74	51	58	59	124	9.7	9.1	17.2	11.8	5.4	4.1
	8,679*											

*Certain of the tests were omitted by several schools, thus materially reducing the average. For most of the tests, however, the total number of scores is over 9,000.

From the discussion above it is evident that the average for any grade represents simply a central tendency from which individuals vary widely. Yet in many ways the average scores of each group, given in Table III, and shown graphically in Fig. 3, reveal the character of the development of each of the abilities through the school and show what should be true of the development of the individual. These data, then, in connection with the distributions from which the averages are derived furnish the desired basis for the selection of standard scores.

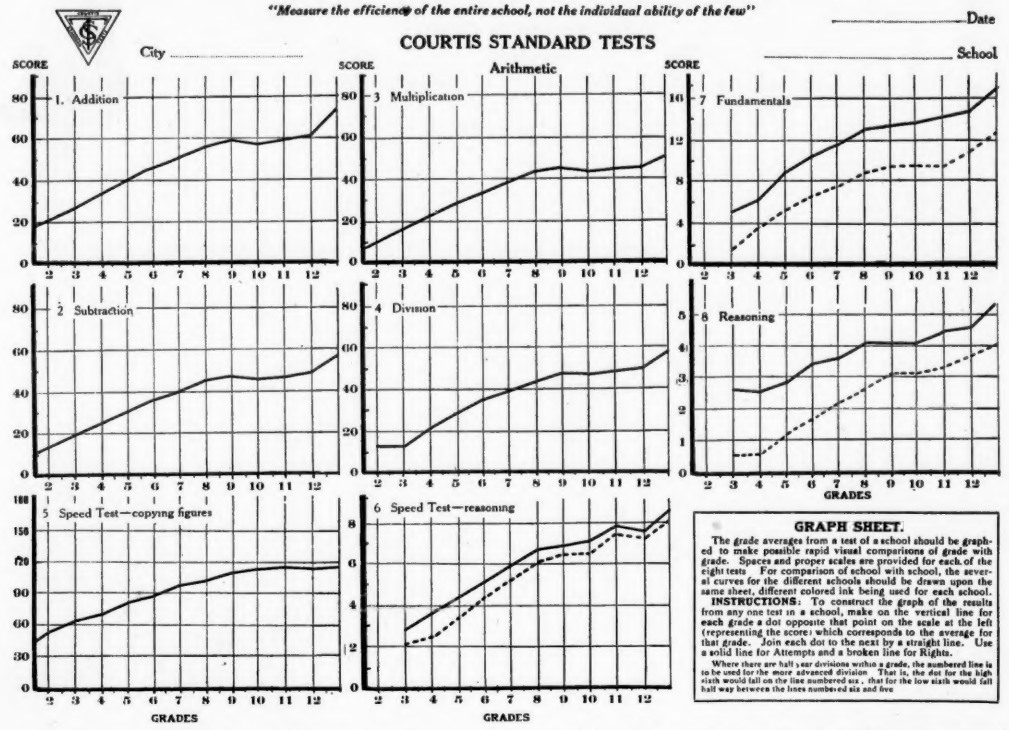
"Measure the efficiency of the entire school, not the individual ability of the few"
COURTIS STANDARD TESTS
City
Date
School
Arithmetic
SCORE
1. Addition
2 Subtraction
3 Multiplication
4 Division
5 Speed Test—copying figures
6 Speed Test—reasoning
7 Fundamentals
8 Reasoning
GRADES
GRAPH SHEET.
The grade averages from a test of a school should be graphed to make possible rapid visual comparisons of grade with grade. Spaces and proper scales are provided for each of the eight tests. For comparison of school with school, the several curves for the different schools should be drawn upon the same sheet, different colored ink being used for each school.
INSTRUCTIONS: To construct the graph of the results from any one test in a school, make on the vertical line for each grade a dot opposite that point on the scale at the left (representing the score) which corresponds to the average for that grade. Join each dot to the next by a straight line. Use a solid line for Attempts and a broken line for Rights.
Where there are half year divisions within a grade, the numbered line is to be used for the more advanced division. That is, the dot for the high sixth would fall on the line numbered six, that for the low sixth would fall half way between the lines numbered six and five

FIG. 3.—Grade averages. Solid lines, attempts; dotted lines, rights. The curves show for each ability the general character of its development through the school. Each curve is based upon approximately 9,000 individual scores.

This table means when put in words that in the third grade, for example, there were 525 individual scores in each test—or about 525. If in some test there were more, as for example, addition, there were enough less in division to make the average number of tests 525. In the addition tests it was found that the standard or average ability was that exhibited by a child who could record 26 in a minute. The standard in subtraction was 19 per minute, and so on.

The writer regrets exceedingly that there is not space to print the distributions in full; for the selection of standard scores must for the present be a matter of individual judgment. Many will be content to use the average scores as standards, and if, indeed, no children in any grade had a lower score than the present average for that grade, the increase in the efficiency of our schools in these abilities would be very great. But the writer feels that a higher score than the average is desirable for a standard and the scores

TABLE IV

STANDARD SCORES

TEST NO.	No. 1	No. 2	Nos. 3 AND 4	No. 5	No. 6		No. 7		No. 8	
					Ats.	Rts.	Ats.	Rts.	Ats.	Rts.
Grade 3	26	19	16	58	2.7	2.1	5.0	2.7	2.0	1.1
Grade 4	34	25	23	72	3.7	3.0	7.0	3.3	2.6	1.7
Grade 5	42	31	30	86	4.8	4.0	9.0	4.9	3.1	2.2
Grade 6	50	38	37	99	5.8	5.0	11.0	6.6	3.7	2.8
Grade 7	58	44	44	110	6.8	6.0	13.0	8.3	4.2	3.4
Grade 8	63	49	49	117	7.8	7.0	14.4	10.0	4.8	4.0
Grade 9	65	50	50	120	8.6	7.8	15.0	11.0	5.0	4.3

given in Table IV were derived as follows: For each test an eighth-grade score was selected such that it was equalled or exceeded by thirty per cent of the eighth-grade children measured. This score was plotted and a smooth curve drawn, having the same general form as the average curve and coinciding with it in the lower grades. The scores for each of the other grades were then determined from the graph.

While the results given above were obtained by the use of special tests, and while for exact comparison the reproduction of the identical tests and the identical conditions are necessary, the

writer hopes that teachers generally will appreciate the fact that the scores above furnish definite objective standards toward which to work. Accurate measurements are needed twice a year; once at the beginning for purpose of diagnosis, and again at the close of the year to measure the effect produced by the teaching effort. But for general class work, approximate values are all that are required. The scores in Table IV should be translated into words: thus, at the end of a year's work, an eighth-grade child should be able to copy figures in pencil on paper at the rate of 117 figures a minute; to write answers to the multiplication combinations at the rate of 49 answers per minute; to read simple one-step problems of approximately 30 words in length and decide upon the operation to be used in their solution at the rate of 8 examples a minute with an accuracy of 90 per cent; to work abstract examples of approximately 10 figures (twice as many for addition) at the rate of 14.4 examples in 12 minutes with an accuracy of 70 per cent; to solve two-step problems of approximately 10 figures at the rate of 5 in 6 minutes with an accuracy of 75 per cent. At the present time 70 per cent of the eighth-grade children cannot meet these standards. But it must be borne in mind that 3 per cent of the fifth-grade children can, and that experience has shown that individual care and a very little, well-managed drill produces marked changes in the abilities of most children.

A word of caution is necessary for those who use these standards. The writer is well aware of the disfavor into which drill has fallen, and he is heartily in sympathy with the ideas and principles which lead to its disuse. On the other hand, no fair-minded person can consider the wide range of variation in all the classes and not realize that something is wrong. It may well be that the pendulum has swung too far. Inordinate drill is surely harmful. Drill out of place is also harmful. But drill in its proper place—after, and not *before*, understanding control—and in proper amount—enough to insure the minimum ability necessary to effective work but not enough to involve waste of teaching effort—such drill is one of the vital factors in efficient teaching. The scores above, while necessarily tentative only, have been selected with due regard for such critical points in the development of these abilities as have been determined. It is probable

that development much beyond the points indicated by the standard scores—and such development is possible—would involve waste of effort and, if not positively harmful, would be useless from the standpoint of efficient, general development. Accurate determination of the proper amount and form of drill required to produce the standard abilities, and similar determinations of standard, yearly growths, are the next problems that will be attacked. For the writer considers that the present investigation has proved that co-operative work on such educational problems is both feasible and of value.

The writer cannot bring this discussion to a close without a plea for both the teacher and the child. When a child's score exceeds the standard for his grade, he will ordinarily need little further attention. The ordinary procedure in grade work furnishes him adequate opportunities and incentives. But when the score is below the standard the case is entirely different. The fault may be in the child. A defective mentality may render the development of a given ability absolutely out of the question. But in such cases it would seem the height of folly and a rank injustice to give a teacher a fourth-grade intellect upon which to work and expect him to secure eighth-grade achievement. Or the child may be normal, but some peculiarity of its mental equipment causes a marked bias in one direction or another. The child that learns addition readily, but falls far below the standard in multiplication, needs special care and special work until the standard ability in multiplication is attained. A balanced, many sided development is the right of all. It is in such cases that standard scores are of the greatest service. On the other hand, the fault may be in the teaching, the course of study, or the methods of work. But here again the number of children who reach, or fail to reach, the standard is the measure of efficiency. From every point of view, therefore, standardization of all school subjects, and the use of standard scores offer a possible escape from present, unsatisfactory conditions.

EDITORIAL NOTES

Attacks on Departments of Education

In the *New York Nation* of September 7, Mr. Warner Fite writes at great length in criticism of teachers of education. He criticizes the professor of education on the ground that he has no special matter to present to students, and on the ground that he has by cunning methods gained recognition in various ways to the disadvantage, as Mr. Fite thinks, of other departments of instruction. Mr. Fite holds that what prospective teachers need is subject-matter and not methods. Students should know how to teach because they have been taught by many instructors each of whom is an example of method. In the *Dial* of October 1, Mr. Fite's remarks are quoted with approval and new adjectives of an opprobrious type are added to those used by Mr. Fite. Both articles are full of bitter personal charges and both are evidently written by writers who have a grievance. It is said for example that the representatives of education as a department are untrained and crude. The science of education is scoffed at without reserve.

The Discussion Shows That the Science of Education Is Known

The appearance of such discussions in journals which address primarily a lay constituency is a matter of great historical interest. Ten years ago there were not enough departments of education in the country to draw the fire of Mr. Fite and the anonymous editorial writer of the *Dial*. The hopes of recognition which were entertained by a few pioneer workers in the science of education seemed very unlikely to be realized. All this has changed. Wherever a university finds itself in real sympathy with the schools it finds more and more reason for training students to study the problems of education. The writer knows of several cases of universities that took on departments of education at first with a great deal of hesitation, but have realized—and that very rapidly—the large service which these departments can render. The fact is, then, that education as a department now has enough standing to bring to it violent

attacks of enemies and on the other hand the strong support of friends. That the friends should be eager and hopeful is not, perhaps, a matter deserving special comment. That the enemies of the subject should be so vigorous is interesting and significant.

Attack Based on Lack of Acquaintance

As in most violent criticisms, so in the present articles there is evidence of much ignorance on the part of the enemy of the progress which has been made in the subject criticized. Probably none would attempt to deny that the science of education has shown many symptoms of its youth in the efforts which it has made to become a mature member of academic society. There are papers on educational science which have in them very little significant material. What of it? Is there any subject taught in our graduate classes which could not be ridiculed because of the trivial character of much that has been written in the name of advanced learning? Certainly it is not these negative phases of the effort toward knowledge which constitute the true basis of a sane estimate of any subject. The real question is what are the successes The successes of education as a science are unknown to Mr. Fite and the anonymous writer in the *Dial*. They show that they have never read such a treatise as Meumann's on experimental education. These people have failed to read with appreciation such studies as those which appear from many different sources in this Journal. They write with boldness while they show, as Professor Bowen used to say of the critics of philosophy, that they are like our first parents in the early dawn of the world, "naked but not ashamed."

Will the Critics Succeed?

What will be the practical effect of such criticism? One can hardly forego the pleasure of recalling a bit of history. Years ago an eminent professor of Harvard announced to the waiting world that there is no use of asking the teacher to read psychology. Many teachers said, "Now we are to be free from the necessity of reading more psychology." The indolent teacher took much satisfaction in the saying. The hopeful teacher felt some discouragement. The earnest student of educational psychology felt some regret that a supposed authority in the subject should turn it out of doors. But days passed by and grew into a decade and behold the pro-

fessor from Harvard wrote a book on psychology especially designed for teachers. Who can tell, perhaps when Mr. Fite is a little older he may come into the fold. He writes a literary style which might serve to rescue the department of education from the accusation that all who contribute to this field are unlettered. His probable skill as a teacher and administrator would furnish suitable material for advice to young pedagogues. At all events the practical outcome of the first attack upon educational psychology was not discouraging and those of us who work in the fie.d are willing to wait until all our enemies, even the bitterest, come over to our side.

Never Were Active Contributions More Numerous

Furthermore, we are not sitting idly by as we wait for Mr. Fite and others to join us. Studies of retardation and elimination are revealing in a new and striking way the problem of the school. The comparative study of grades is doing much to co-ordinate institutions. The methods of writing and reading and number are more economical and productive than they ever were—and what is more, we can prove it. The instruction in modern language is on a sounder basis than instruction in any of the antique and departed languages ever was. School finance is sounder than it ever was because we understand its principles. School promotions are more frequent and more just because the study of the problems involved has been taken up in Indianapolis and elsewhere. So one might go on. We ought to be very grateful to Mr. Fite and the writer in the *Dial* for an opportunity to write editorials and take some partial notice of the bright side of life. They are very generous to give us of their time and examples as a basis for popular consideration of the fact that we are alive.

C. H. J.

BOOK REVIEWS

Experiments in Educational Psychology. By DANIEL STARCH, Doctor of Philosophy, University of Wisconsin. New York: Macmillan, 1911.

The problem of providing experiments for classes in general psychology has been met by the appearance in recent years of several types of books. Some of these books deal with a few selected experiments. Others have attempted to present in an elaborate form all of the different methods of experimentation. Some of the books are intended for use in separate classes, while some of the material has been so organized that it can be used with the general text, the student performing the experiments at the same time that he studies the theoretical material presented in such text.

Mr. Starch's book is the first effort to select material which is peculiarly adapted to the needs of students who are specializing in educational psychology. Some of the experiments are the same as those that are presented in the laboratory books that are to accompany general courses. A number of the experiments, however, are different, but in all cases there is some effort to adapt even the general experiments to the needs of this special group of students. The experiments described by Mr. Starch require very little apparatus. Many exercises are incorporated in the book itself, so that the student can use the printed page as the equipment for the experiment. There are experiments on individual differences, on the different tests for the senses, and for the simpler psychological processes. There are experiments in learning, transfer of training, and fatigue. The selection of experiments is very good, and follows closely the course of study which has been employed at the University of Wisconsin. This course was originally planned by Professor Dearborn, and much of the material contained in the book is borrowed directly from the exercises which he prepared in the course at that institution.

The book will undoubtedly be useful to normal-school teachers of psychology. It is also a book which the individual teacher might with great advantage take up quite apart from any instructor. The difficulty with private experiments has always been that the interpretation of results is usually the most difficult, and at the same time the most productive, part of such an exercise. Unless there is a mature experimenter at hand to give suggestions with regard to the interpretation of results the outcome of individual experimentation is likely to be somewhat confusing. The book contains suggestions of interpretation and if it is used with parallel readings some of the difficulties of interpretation will be met.

Above all, the book illustrates very clearly the advantages of substituting for a mere theoretical text in psychology practical exercises of an experimental type. It will be welcome as a part of the general movement toward the development and establishment of a science of experimental education. C. H. J.

CURRENT EDUCATIONAL LITERATURE IN THE PERIODICALS[1]

IRENE WARREN
Librarian, School of Education, The University of Chicago

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BELLAMY, GEORGE A. Evening recreation. Playground 5:239–44. (O. '11.)

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BOONE, RICHARD G. The Kindergarten. Its influence upon higher education. Kind. R. 22:69–76. (O. '11.)

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[1] *Abbreviations.*—Atlan., Atlantic Monthly; Cent., Century; Child Wel. Mag., Child Welfare Magazine; Educa., Education; Educa. R., Educational Review; El. School T., Elementary School Teacher; Harp. W., Harper's Weekly; Journ. of Educa. (Lond.), Journal of Education (London); Kind. R., Kindergarten Review; Liv. Age, Living Age; McClure's Mag., McClure's Magazine; Out., Outlook; Pop. Sci. Mo., Popular Science Monthly; Pri. Educa., Primary Education; School R., School Review; Training Mag. (N.J.), Training Magazine (New Jersey); Vocat. Educa., Vocational Education.

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SHERMAN, WALDO H. The boy scouts, 300,000 strong. World's Work 22:14859–72. (S. '11.)
STITT, EDWARD W. Dancing in the social centers of New York City. Playground 5:236–39. (O. '11.)
STORROW, MRS. J. J. Folk dancing. Playground 5:161–68. (Ag. '11.)
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WHITE, FRANK MARSHALL. How a boy was made a thief and the fight to reclaim him. World's Work 22:14843–50. (S. '11.)
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